

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
Permitting and Compliance Division
Water Protection Bureau
P.O. Box 200901
Helena, MT 59620-0901

Permit Fact Sheet
Montana Ground Water Pollution Control System (MGWPCS)

Permittee:	Jefferson Local Development Corp
Permit No.:	MTX000192
Receiving Water:	Class I Ground Water
Facility Information	
Name:	Sunlight Business Park
Mailing Address:	P.O Box 1079 309 East Legion Whitehall, MT 59759
Contact:	Tara Mastel
Phone:	(406) 287-3282
Fee Information	
Number of Outfalls:	1
Outfall - Type:	001a Drainfield, Domestic Wastewater 001b Drainfield, Domestic Wastewater

I. Permit Status

This is a new permit for a wastewater treatment system servicing the Sunlight Business Park (SBP) in Whitehall Montana. The SBP has proposed to discharge residential wastewater to state waters. SBP is not exempt from the need for a permit under the Montana Water Quality Act (75-5-401) and the Administrative Rules of Montana (ARM) 17.30.1022 (1) (C). As such they are required to apply for a Montana Ground Water pollution Control System (MGWPCS) permit. The Department received the initial permit application and supporting documents on December 22, 2006. The application was determined to be deficient on January 4, 2007, September 27, 2007 and again of February 29, 2008. The Department received responses to all the deficiency letters. Supplemental application materials were received and the permit application was deemed complete on October 22, 2008. The Departments Subdivisions section has issued EQ # 07-1855 to this project.

II. Facility Information

A. Facility Description

The SBP wastewater treatment system reported an estimated a maximum discharged wastewater volume of approximately 31,800 gallons per day (gpd), from 12 commercial lots. Each commercial lot will have its own dual compartment septic tank and Orenco Biotube effluent filter. Wastewater from each septic tank will be conveyed to a dose tank with an effluent pump. Wastewater will then be routed via sewer main to a 25,000 gallon recirculation tank. At this point wastewater will be treated in Advantex AX100 treatment pods. From the Advantex treatment pods, effluent is directed to a 10,000 gallon dose tank and ultimately dosed to 2 multi zoned drainfields.

The proposed wastewater treatment system will discharge via two multi-zoned drainfields. Each drainfield will have two zones. The drainfields will be deemed outfalls 001a and 001b. The drainfields are located on the hydraulically up-gradient side of the SBP property. Outfall 001a and 001b are situated in T02N, R03W, in the southeast ¼ of Section 31, or N 45° 52' 43.8" latitude and W 112° 0' 48.2" longitude in Jefferson County, Montana. The northern most drainfield will be identified as Outfall 001a. The southern most drainfield will be identified as Outfall 001b.

B. Effluent Characteristics

The wastewater treatment system is not an existing source, as such no effluent quality samples were collected and analyzed. Effluent quality data from a similar Orenco system, located in a similar climate provided in the permit application is listed in table 1.

Table 1. Effluent Characteristics

Parameter	Units	Maximum	Average
pH	S.U	8.5	6.0
Total Suspended Solids (TSS)	mg/L	25	10
Biological Oxygen Demand (BOD)	mg/L	25	10
Oil & Grease	mg/L	5	<2
Total Residual Chlorine	mg/L	0	0
Escherichia Coli	Organisms/100 ml	>2x10 ⁴	<4x10 ³
Ammonia	mg/L	8	5
Total kjeldahl Nitrogen	mg/L	12	8
Nitrate plus Nitrite, as N	mg/L	20	16
Total Phosphorous, as P	mg/L	10	7
Total Dissolved Solids (TDS)	mg/L	770	630
Specific Conductivity	µmhos/cm	1200	890
Chloride	mg/L	150	<100

III. Proposed Technology Based Effluent Limits

Establishing numeric effluent limits based on the type of treatment system are authorized under the nondegradation rules [ARM 17.30.702 (9) (10) and (11)]. However, the receiving ground water has been classified as class III ground water (See discussion in section IV. A of this document). Class III ground water is not considered high quality water 75-5-103 (10) Montana Code Annotated (MCA). Therefore, discharge to class III ground water is not subject to review under the nondegradation policy pursuant to 75-5-303 (2) and 17.30.705 (2)(b).

IV. Water-Quality Based Effluent Limits

A. Receiving Water

The applicant submitted ground water analytical data from 2 onsite monitoring wells (MZW-1 and MZW-2). All ground water quality data used in development of permit conditions comes from monitoring wells that are located within 500 feet of the discharge site. Ground water quality sampling was conducted up gradient monitoring well MZW-1. This monitoring well is a shallow monitoring well located approximately 75 feet up-gradient of the proposed discharge. Sampling events occurred on June 30, 2008, August 8, 2008 and September 22, 2008. Ground water quality analysis for the above mentioned sampling events is listed in Table 3. Well logs for monitoring wells MZW-1 and MZW-2 indicate total depths of about 80 and 100 feet and shallow ground water at approximately 60 and 90 feet below ground surface respectively (Permit application supplemental materials 2008).

Application materials submitted to the Department by the applicant reported the hydraulic conductivity (K) of the aquifer as approximately 12 ft/day. Values for hydraulic conductivities were generated from onsite well tests. The estimated (K) of 12 ft/day is derived from the average of 3 onsite wells. Shallow ground water occurs in the vicinity of the site between 60-90 feet, as is confirmed by onsite wells and ground water characterization conducted by Kerin & Associates P.C (permit application 2008). The hydraulic gradient in the shallow ground water was calculated as 0.045ft/ft, estimated from 3 onsite monitoring wells.

Table 2. Ground Water Monitoring Results

Monitoring Well	Date Samples	pH	Fecal Coliform	Nitrate +Nitrite mg/L	Specific Conductivity	Total Organic Carbon mg/L	Chloride mg/L
MZW-1 (Up Gradient)	June 30, 2008	7.5	ND	ND	3590	13.9	47.6
	August 7, 2008	7.6	ND	ND	3670	1.9	46.1
	September 21, 2008	8.2	ND	ND	3540	1.4	42.9

Sampling events (Table 2) yielded specific conductivity values of between 3,940 and 3,540 $\mu\text{s}/\text{cm}$. Therefore, the receiving water for Outfall 001a and 001b is considered class III ground water as defined by the Administrative Rules of Montana [ARM 17.30.1006 (3)] (ground water with specific conductance greater than 2,500 and less than 15,000 $\mu\text{s}/\text{cm}$). Class III ground water is to be maintained for the following beneficial uses with little or no treatment: irrigation of some salt tolerant crops; some commercial and industrial purposes; drinking water for some livestock and wildlife; and drinking culinary and food processing purposes where the specific conductance is less than 7,000 microSiemens/cm.

Water quality human health standards (DEQ-7, February 2006) apply to concentrations of substances in Class III ground waters where the specific conductance is less than 7,000 microSiemens/cm ARM 17.30.1006 (3)(b)(i). Pursuant to ARM 17.30.1006(3)(b)(ii) for parameters that are not listed in DEQ-7, there shall be no increase in Class III receiving water concentrations to levels that render the water harmful, detrimental or injurious to the beneficial uses listed for Class III waters. The Department may use any credible information to determine these levels.

Based on proximity, the nearest surface water to the Outfall is the Jefferson Slough, a portion of the Jefferson River. Based on proximity, the slough is approximately 2,000 feet south of the proposed discharge. Based on the direction of ground water flow, the nearest surface water to the Outfall is the also the Jefferson Slough, approximately 3,000 feet down gradient and to the southeast. Ground water flow direction in the vicinity of the drainfield was reported to be approximately S42°E. Ground water flow direction of the shallow aquifer was established via data collected from monitoring wells on-site.

B. Basis for Water Quality Based Effluent Limits

ARM 17.30.506 (1) states that a discharge to state waters shall not cause a violation of a water quality standard outside a Department authorized mixing zone. Water quality limitations must be established in permits to control all pollutant or pollutant parameters that are or may be discharged at a level which will cause, have reasonable potential to cause or contribute to an excursion above any state water quality standard. The permittee must comply with the permit developed by the Department in accordance with the Montana Numeric Water Quality Standards included in Circular DEQ-7 (February 2006) and protection of beneficial uses (ARM 17.30.1006).

The applicable ground water standard, a nitrate as N concentration of 10.0 mg/L at the end of the proposed standard mixing zone is based on DEQ-7 and ARM 17.30.1006 (3)(b)(i)]. The Department assumes all the nitrogen discharged to the drainfield in the effluent is converted to nitrate as nitrogen. The allowable discharge concentration is derived from the mass balance water quality equation, which considers dilution and background concentration of the receiving water (EPA, 2000).

$$C_2 = \frac{C_3(Q_1 + Q_2) - C_1 Q_1}{Q_2}$$

- C_1 = ambient ground water (background) concentration, mg/L
 C_2 = allowable discharge concentration, mg/L
 C_3 = ground water concentration limit for pollutant (from Circular DEQ-7 February 2006 or other appropriate water quality standard) at the end of the mixing zone.
 Q_1 = ground water volume (ft³ / day)
 Q_2 = maximum flow of discharge (design capacity of system in ft³ / day)

The volume of ground water that will mix with the discharge (Q_s) is estimated using Darcy's equation: $Q_1 = K I A$.

Where:

- Q = ground water flow volume (ft³/day)
- K = hydraulic conductivity (ft/day)
- I = hydraulic gradient (ft/ft)
- A = cross-sectional area (ft²) of flow at the down-gradient boundary of the mixing zone.

Hydraulic conductivity (K) of the alluvium is estimated at 15 feet per day (ft/d). The gradient was calculated based on well data from wells surrounding the site, at 0.045 ft/ft. The area (A) is calculated by the width of the terminus of the mixing zone perpendicular to the ground water flow direction (364 feet), times a standard depth of 15 feet [17.30.517 (1)(D)(iii)(A)].

$$(Q_{-001}) = (15 \text{ ft/day})(0.045 \text{ ft/ft})(5,460 \text{ ft}^2)$$

$$Q_{1-001} = 3686 \text{ ft}^3/\text{day}$$

The design capacity of the entire wastewater disposal system is 31,800 gpd, or 4,251 ft³/day. The applicable water quality standard of 10.0 mg/L must be met at the end of the mixing zone. The permit application indicated up gradient ground water quality did not detect the presence of nitrate or nitrite. Therefore a concentration of nitrate as N of 0.0 mg/L was used in calculating the allowable nitrogen concentration at the end of the mixing zone. It is assumed that the entire total nitrogen load in the seepage effluent converts to nitrate and enters the ground water.

$$\begin{aligned}
 C_2 &= \frac{10.0 \text{ mg/L} (3,686 \text{ ft}^3/\text{day} + 4,251 \text{ ft}^3/\text{day}) - (0.0 \text{ mg/L}) (3,686 \text{ ft}^3/\text{day})}{(4,251 \text{ ft}^3/\text{day})} \\
 &= 18.7 \text{ mg/L}
 \end{aligned}$$

The projected daily maximum concentration of the total nitrogen in the effluent discharged to groundwater must not exceed 18.7 mg/L. The Department assumes an additional 7% nitrogen removal occurs within the drainfield providing a final total nitrogen concentration discharged to

ground water of 20.0 mg/L. These effluent limits ensure the nitrate plus nitrite (as N) concentration at the end of the ground water mixing zone are at or below the water quality standard of 10.0 mg/L.

D. Phosphorus

Effluent limits for Phosphorous are based on the nondegradation rules of ARM 17.30.701-718 and the water quality standards of DEQ-7. As the non degradation rules do not apply to the receiving water (as is discussed in section IV. A of this document) and there is no water quality standard for phosphorous, the Department will not develop a permit limit for phosphorous.

The proposed water quality effluent limits for outfalls 001a and 001b are presented in Table 3.

Table 3. Water-Quality Based Effluent Limits for Outfalls 001a and 001b

Parameter	Concentration (mg/L) Daily Maximum ⁽¹⁾	90 Day Average Load ⁽²⁾ (lbs/ per day)
Nitrogen as N	20.0	5.3

(1) See definitions, Part I.A of the permit

(2) Load calculation: lb/d = (mg/L) x flow (gpd) x 8.34×10^{-6}

F. Mixing Zone

The shape of the proposed mixing zones is determined from the drainfield dimensions, ground water table elevation, and groundwater flow direction. This information was submitted with the permit application and is discussed in length in Section IV. A. of this document. The Department will grant a mixing zone for the single parameter nitrate as N . Due to the proximity of the drainfields the Department will grant a single mixing zone for Outfall 001a and 001b.

The permittee must comply with the ground water mixing zone rules pursuant to ARM 17.30 Subchapter 5 and all applicable ground water quality standards. Ground water quality standards may be exceeded within a Department authorized mixing zone (ARM 17.30.1005), provided that all existing and future beneficial uses of state waters are protected [ARM 17.30.506 (1)]. The concentration of nitrate as N must not exceed 10.0 mg/l on the hydraulically down gradient boundary of the mixing zone [ARM 17.30.715(1)(d)(iii)].

V. Final Effluent Limits

Pursuant to 75-5-402 (3), ARM 17.30.1031(2), ARM 17.30.1005 (1)and ARM 17.30.1006 (1)(a) the Department will implement limits such that the discharge from outfalls 001a and 001b shall not cause increase of a parameter to a level that renders the water harmful, detrimental or injurious to the beneficial uses listed for class III water.

The permittee submitted technical information indicating the design capacity for the treatment systems serving outfalls 001a and 001b as 31,800 gpd. The design flow is the peak flow (daily or instantaneous) for sizing hydraulic facilities, such as pumps, piping, storage and adsorption systems and means the average daily flow for sizing other treatment systems. An effluent flow limit will be

established to ensure that flows do not exceed the capacity of the treatment system. The combined flow limit from outfalls 001a and 001b shall not exceed the design capacities of 31,800 gpd based on the daily average.

The proposed final effluent limitations for Outfall 001a and 001b are summarized in Table 4 and are based on the water quality based effluent limits discussed in section IV.

Table 4. Numeric Effluent Limits for Outfall 001a and 001b

Parameter	Concentration (mg/L) Daily Maximum ⁽¹⁾	90 Day Average Load ⁽²⁾ (lbs/ per day)
Nitrogen as N	20	5.3

(1) See definitions, Part I.A of the permit

(2) Load calculation: $\text{lb/d} = (\text{mg/L}) \times \text{flow (gpd)} \times 8.34 \times 10^{-6}$

VI. Monitoring Requirements

Effluent limits are established to protect the ground water from a change in water quality that would limit a beneficial use [ARM 17.30.1006(1)(a)]. MGWPCS permits must contain conditions which will assure compliance with the ground water quality standards. These conditions include self monitoring of discharge ARM 17.30.1031 (5). Therefore effluent quality and ground water quality monitoring will be required in this permit. Effluent quality samples or measurements shall be representative of the volume and nature of the monitored discharge. Effluent quality monitoring shall occur from the dosing tank prior to discharge into the drainfields. Effluent samples shall be composite in nature.

The permittee shall monitor the effluent for the constituents in Table 5 at the frequency and with the type of measurement indicated. If no discharge occurs during the entire monitoring period, it shall be stated in a Discharge Monitoring Report (DMR) that no discharge occurred.

Average daily flow shall be measured when required sampling is conducted (flow measurement must correspond to sample collection to calculate an accurate load). The permittee shall monitor the flow of the effluent continuously and report the average daily flow in gallons per day. The effluent flow measurement method shall be either by flow meter and recorder or a totalizing flow meter; dose counts or pump run-times will not be accepted. Flow measurement equipment must have the ability to report an average daily flow.

Table 5. Outfall 001a and 001b Parameters Monitored at the Dose Tank

Parameter	Frequency	Sample Type⁽¹⁾
Effluent Flow Rate, gpd ^{(2) (3)}	Daily ⁽¹⁾	Continuous ⁽¹⁾
Biological Oxygen Demand (BOD ₅), mg/L	Quarterly	Composite
Total Suspended Solids (TSS) mg/L	Quarterly	Composite
Total Kjeldahl Nitrogen (TKN), mg/L	Quarterly	Composite
NO ₃ +NO ₂ as N, mg/L	Quarterly	Composite
Nitrate as N, mg/L	Quarterly	Composite
Ammonia, as N, mg/L	Quarterly	Composite
Total Nitrogen (as N), mg/L	Quarterly	Calculated
Total Nitrogen (as N), lb/d	Quarterly	Calculated
Total Phosphorus (as P), mg/L	Quarterly	Composite
Total Phosphorus (as P), lb/d	Quarterly	Calculated
Chloride, mg/L	Quarterly	Composite

(1) See definitions, Part I.A of the permit

(2) If no discharge occurs during the reporting period, "no discharge" shall be recorded on the DMR

(3) Permittee is to report the average daily and 90 day average

A. Ground Water Monitoring

Ground water monitoring will be required in this permit due to the following site-specific criteria:

- This area is experiencing rapid growth with high density development.
- Lack of advanced wastewater treatment
- The need to distinguish the effects to ground water of the discharging wastewater treatment system.
- To ensure that existing and future beneficial uses are protected
- To ensure that no ground water quality standards are exceeded at the end of the Department authorized mixing zone.

The permittee is required to monitor the ground water on the downgradient edge of the 500-foot mixing zone. The permittee will be required to install a minimum of one monitoring well at the end of the mixing zone. This monitoring well shall be located in the centerline of the terminus of the mixing zone for outfall 001a and 001b. Please see section VIII. B. of this document for further information regarding groundwater quality monitoring. The permittee will conduct quarterly monitoring for the parameters listed in Table 6.

Table 6. Monitoring Parameters for Monitoring Wells:

Parameter	Frequency	Sample Type ⁽¹⁾
Static Water Level (SWL) (feet below the casing top)	Quarterly	Instantaneous
Specific Conductance, $\mu\text{s}/\text{cm}$	Quarterly	Grab
Chloride, mg/L	Quarterly	Grab
Escherichia Coli (Organisms/100 ml)	Quarterly	Grab
Total Ammonia, as N, mg/L	Quarterly	Grab
NO_3+NO_2 as N, mg/L	Quarterly	Grab
Nitrate as N, mg/L	Quarterly	Grab

(1) See definitions, Part I.A of this permit

VII. Nonsignificance Determination

The Department has determined that the discharge constitutes a new or increased source. However, the receiving water has been classified as class III ground water. Class III ground water is not considered high quality water 75-5-103 (10) Montana Code Annotated (MCA). Therefore, discharge to class III ground water is not subject to review under the nondegradation policy pursuant to 75-5-303 (2) and 17.30.705 (2)(b).

VIII. Special Conditions/Compliance Schedules

a) Effluent Flow Measurement

To ensure that the total phosphorous load is calculated correctly, an accurate daily flow must be measured. The Department requires that samples or measurements be representative of the volume and nature of the monitored discharge. Effluent flow shall be monitored from the dose tank immediately prior to discharge into the drainfields. The measurement method shall be either by recorder or a totalizing flow meter dose counts or pump run-times will not be accepted. The permittee shall monitor the flow of the effluent continuously.

b) Monitoring Well Installation

The applicant will be required to install a minimum of one monitoring well, one at the end of the mixing zone. This monitoring well shall be located in the centerline of the terminus of the mixing zones for outfall 001a and 001b. This well shall be screened from the top of the high water table to 15 feet below the low water table.

Ground water quality monitoring shall begin within 180 days of the effective date of the permit and continue through the duration of the permit. The permittee shall submit to the Department a brief report or letter documenting the results of the monitoring well installation including the final location of the installed monitoring wells, construction details for the well and a report on ground water quality in the from the well. Ground water quality analysis shall include those parameters listed in Table 6.

IX. Information Source

In the development of the effluent limitations, monitoring requirements and special conditions for the draft permit, the following information sources were used to establish the basis of the draft permit and are hereby referenced:

ARM Title 17, Chapter 30, Sub-chapter 5 - Mixing Zones in Surface and Ground Water, September 1999.

ARM Title 17, Chapter 30, Sub-chapter 7 - Nondegradation of Water Quality, March 2000.

ARM Title 17, Chapter 30, Sub-chapter 10 - Montana Ground Water Pollution Control System (MGWPCS), March 2002

Environmental Protection Agency, U.S. EPA NPDES Permit Writers Manual, December 1996

Environmental Protection Agency, U.S. EPA Wastewater Technology Fact Sheet, Package Plants, EPA 832-F-00-016 September 2000.

Environmental Protection Agency, Design Manual: Onsite Wastewater Treatment System Manual. EPA 625/R-00/008, 2002.

Department of Environmental Quality, Circular DEQ-7, Montana Water Quality Standards. February 2008

Fetter, C.W., Applied Hydrogeology, 1988

Kerin & Associates, P.C, Montana Groundwater Pollution Control System Permit Application. Received December 22, 2006.

Regensburger, E. How to Perform a Nondegradation Analysis for Subsurface Wastewater Treatment Systems. Montana Department of Environmental Quality. 2005

United States Department of Agriculture, Natural Resource Conversation Service,
<http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx> .

Prepared By: Louis Volpe November 19, 2008

